

---

# Commercial Refrigeration (Supermarkets) Title 24 Standards

## Leak Reduction Measures (Design and Installation)

Proposed 12/16/10



ICF International  
California Energy Commission  
Heschong Mahone Group, Inc.  
VaCom

# Leak Reduction Measures

---

- Measures aimed at ensuring “base practices” for minimizing leakage at system design & installation
  - Intended to set “floor,” not “ceiling”
- Measures are cost-effective & reflective of basic good practice
- Sources used to develop measures:
  - American National Standards Institute (ANSI) standards
  - American Society of Heating, Refrigerating, and Air-Conditioning (ASHRAE) standards
  - The International Mechanical Code (IMC)
  - Stakeholder input (equipment manufacturers, contractors, users)

# Draft Leak Reduction Measures

---

- Twelve draft proposed measures\*
  - #1–3 related to piping
  - #4–6 related to valves
  - #7–12 related to other installation practices

*\*Since September, some measures have been deleted, combined, and/or revised based on additional research and stakeholder input*

# Draft Leak Reduction Measure #1

---

- *Piping runs using threaded pipe must not be used for refrigeration lines (e.g., if steel piping is used, it must be welded). This does not include the control connections at the compressor.*

## Benefits

- Threaded joints can seep refrigerant; welded piping is more durable, less prone to leakage over long-run

## Cost

- Minimal; costs of welded/brazed vs. threaded pipe depends on pipe size & skill set of installers

# Draft Leak Reduction Measure #2

---

- *Use of copper tubing with an outside diameter (OD) smaller than 1/4" is prohibited in all but systems with a refrigerant charge of 5 lbs or less. When using 1/4" tubing, it must be clamped to a rigid base every 2 feet.*

## Benefits

- Prone to failure when subject to severe vibration

## Cost

- ~\$30/system for additional labor; will depend on store size

# Draft Leak Reduction Measure #3

---

- *Flare fittings prohibited from use on all refrigerant applications with the exception of pressure controls, valve pilot lines, and oil lines.*
- *In these exception cases, pressure controls and valve pilot lines must use double-flare connections.*

## Benefits

- Flare fittings are more leak-prone than brazed/threaded fittings
- Flare fittings on expansion valves more difficult to access for leak checking

## Cost

- Minimal; flare fittings may be easier (i.e., faster, cheaper) to service

# Draft Leak Reduction Measure #4

---

- *Pressure relief valves must be equipped with a device to indicate a release of refrigerant (e.g., manufacturer-installed diaphragm with a visual indicator).*

## Benefits

- Service technicians can more easily identify valves that have discharged so that they may be checked for possible refrigerant seepage

## Cost

- Rupture disc relief valve with a gauge ~\$140/pressure relief valve

# Draft Leak Reduction Measure #5

---

- *Only Schrader access valves with a brass body are permitted for use.*
- *For systems with  $\geq 5$  lbs refrigerant, valve caps on Schrader access valves shall be brass (not plastic); a neoprene O-ring seal must be in place, if designed for it.*

## Benefits

- Prohibits the use of valves that are more prone to leakage

## Cost

- <\$15-\$20/valve (for brass vs. plastic caps)

# Draft Leak Reduction Measure #6

---

- *Valves not having an internal stem diaphragm must have seal caps with chain tethers to fit over the stem.*

## Benefits

- Ensures caps are installed with the proper O-ring seal in place
- Caps less likely to be lost or misplaced with chained tethering

## Cost

- <\$15-\$20/valve (will depend on size of valve)

# Draft Leak Reduction Measure #7

---

- *Evaporator coils in deli cases must be coated to prevent corrosion from vinegar and salt solutions in the displayed product.*

## Benefits

- Protecting coils in deli cases reduces corrosion, which can lead to leakage

## Cost

- ~\$300– \$700/coil for coating (will depend on size of coils, type of coating, and manufacturer/service provider)

# Draft Leak Reduction Measure #8

---

- *Piping and components shall be installed in such a manner as to protect the piping and components from physical damage.*

## Benefits

- Poorly placed components are more susceptible to breakage & leakage

## Cost

- Expected to be negligible; measure can easily be addressed in design process

# Draft Leak Reduction Measure #9

---

- *Refrigerant piping shall be installed in such a way so that it is accessible for leak detection and repairs.*

## Benefits

- Piping that can't easily be leak checked or replaced is more susceptible to undetected and prolonged leaks

## Cost

- Will vary on a store by store basis; measure can be addressed in design process

# Draft Leak Reduction Measure #10

---

- *Install receiver level sensors on receivers with 200 pounds or more of refrigerant.*

## Benefits

- Can be used to detect leaks that may not otherwise be easily detected

## Cost

- Cost estimates being developed

# Draft Leak Reduction Measure #11

---

- *Pressure test system during installation prior to evacuation & charging:*
  - *Charge the system with regulated dry nitrogen and the appropriate tracer gas to bring system pressure up to 300 psig minimum.*
  - *After the system has been checked for leaks and all leaks have been repaired and retested, the system must stand, unaltered, for 24 hours with no more than a +/- 1 pound pressure change from 300 psig, using the same gauge.*

## Benefits

- Holding the system at a high pressure for 24 hours will pick up even small leaks, thus ensuring leak tightness of equipment at installation

## Cost

- Associated with evacuation & isolation procedures, which could result in additional labor time & delay in the store opening

# Draft Leak Reduction Measure #12

---

- *Evacuate system following pressure testing & prior to charging:*
  - *Pull a system vacuum down to at least 1000 microns (+/- 50 microns) and hold for 30 minutes.*
  - *Pull a second vacuum to a minimum of 500 microns and hold for 30 minutes.*
  - *Pull a third vacuum to a minimum of 300 microns and hold for 24 hours with a maximum drift of 100 microns over the 24-hour period.*

## Benefits

- Pulling system vacuum three times will validate leak tightness while ensuring that the system is free of impurities prior to charging

## Cost

- Associated with evacuation & isolation procedures, which could result in additional labor time & delay in the store opening

# Contact Information

---

Comments on proposed measures can be provided to:

CEC: Martha Brook  
(916) 654-4086  
Mbrook@energy.state.ca.us  
or

ARB: Glenn Gallagher  
(916) 327-8041  
ggallagh@arb.ca.gov

For more background on measures visit:  
<http://www.h-m-g.com/T24/CASE.htm>